SCIENCE

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THE TECHNICAL SCHOOL AND THE UNIVERSITY.

DURING the past four hundred years there has been a most significant although gradual development in the university organization. This has been a necessary result of the evolution of knowledge. The earliest continental universities found a reason for their being in the dissemination of a system of scholastic learning which had little to do with the affairs of men. A body of learning based chiefly if not wholly upon certain conventional systems of abstract knowledge like the Aristotelian logic, transmitted with little or no change from the masters of antiquity, constituted essentially all they had to offer to their students. The instruction consisted almost entirely of certain exercises in this intellectual inheritance practically unchanged through the centuries of its transmission. This mental training had essentially no relation to or bearing upon the actual things of human experience, nor had it much effect upon national life or upon any of the varied interests of the community.

In the beginning of the sixteenth century, however, when the dark shadows of the middle ages began to disappear before the illuminating influence of a truer knowledge, a remarkable movement began in a contest which has scarcely been closed to this day. The intense struggle between humanism and scholasticism began in and around the German universities in the early years of the sixteenth century. The

actors in this new culture rejected the old sterile instruction with merciless vigor and displaced it with systems of study touching as closely as possible the actual life of those times. It was their open purpose in which they gloried to treat of things as they actually existed, to get as near to the life of the community as the best knowledge would bring them; in other words, to touch human life intimately and at the greatest possible number of points.

Scarcely had the humanistic movement reached a successful issue, before it was supplemented by the reformation. Although this great religious upheaval was destined ultimately to aid the humanistic movement, an intense struggle marked the first stages of their concurrent development. While the ultimate effects of these two epoch-making movements were virtually the same in their influence upon the advancement of knowledge and upon the evolution of the university, the fundamentally different characters of their two great representatives led to intellectual contests of exceeding bitterness. Fortunately, however, their efforts to advance knowledge along these different lines created a common spirit of true learning, which has been the living stimulant of university life from that day until this.

During the sixteenth and seventeenth centuries the university may be said to have consisted of the philosophical and theological faculties, supplemented by the faculties of law and medicine. The subsequent extensions of the university throughout the eighteenth century resulting from its closer contact with the things disclosed by experience and its widening influence upon all branches of human activity, were chiefly marked by the strengthening of the faculties of law and medicine.

Throughout all this period of over three centuries the philosophical faculty was predominant in its position and influence in the university. It had come to represent a body of more or less abstract instruction covering by far the greater part of the existing field of human knowledge, and, it must be said, divorced largely from the real things to which it properly belonged. In the early history of universities it constituted a sort of purveyor of privileged or aristocratic learning ostensibly of better birth than the professional faculties of law and medicine, which had the misfortune to deal with the actualities of life on which the welfare and safety of communities no less than the rights and duties of individuals are fundamentally based. This conventional class distinction constituting a kind of snobbery of learning was the real influence or force so completely overcome by the movements of humanism and the reformation, and it has bequeathed to us the useless and senseless term 'pure' science as opposed to applied science; as if there could be in some way a science politely distilled as an essence of learning separated from the realities with which absolutely all science whatever has to deal and without which no science whatever can exist. A mere scholastic philosophy based upon the sterility of bare convention and authority was displaced by an honest and fearless search for the real knowledge which lies at the base of all true learning. The deadening influence of prescribed knowledge gave way to the quickening stimulus of individual power and freedom of investigation in every field of experience. All the professional schools of the university, prominent among them being the modern technical schools, are the fruitful products of this ever increasing and abundant intellectual life.

During the latter part of the eighteenth and throughout the nineteenth century the extensions of all branches of physical science so enlarged their fields of application that the foundations were laid of an-

other distinct and prominent faculty. The great investigators in chemistry, in physics, in biology and in the marvelous combinations and ramifications of those and other affiliated sciences were the pioneers in the service rendered by science to the creation of the industries of the world which have been such potent agents in the extraordinary advancement of civilization during the past one hundred and fifty years. Every addition to scientific knowledge, meaning simply a closer contact with the realities of our natural environment, has supplied a corresponding field of activity for useful effort and in just that much has enlarged the meaning and the volume of life.

All these practical or useful extensions of technical knowledge have in fact been made possible by the technical work of the university, although many of the greatest investigators and of those who have been most successful in enlarging useful production have received their individual stimulus and prosecuted their life work outside of the university organization. The university has been the nursery of useful scientific investigation and the influence of its instruction has extended with an ever-increasing acceleration far beyond the limits of its immediate environment. The practise of every technical profession is founded upon precisely that quality and kind of knowledge established by investigation and by instruction at those centers of learning which only have been the originators and transmitters of useful knowledge from the earliest beginnings of science to the present day. Although there has been much scientific investigation and remarkable applications of science to human activities by individuals or in communities, to whom apparently even the meaning of university work was unknown, the fundamental principles on which the value of the subsequent technical work is wholly based will be found in practically or absolutely all cases to have germinated in the fertile soil of the university.

The initial stages of technical education took form first in the universities of Europe. The subsequent development of that educational work into complete technical faculties is found to have been practically concurrent in the universities of both Europe and America, although the former have precedence in time over the latter by comparatively short periods. These faculties have not always been known by the names of the professional practise for which it is the purpose to prepare their students, but the apparent defect in the continuity of the case is not real. In the earliest university courses of technical study instruction was given in a substantial number of technical subjects under a faculty of broader jurisdiction than that confined to a technical profession, and in some of them that method is pursued even at the present time. Such courses of study effectually answered their purpose in the early days of the engineering and allied professions, but their administration has generally been advanced by a natural development concurrent with the growth of the professions which they have served, to remarkable groups of technical faculties of such prominence and intellectual strength and with such numbers of students as almost to dominate the true university in some cases, and even to form essentially technical universities in others.

These great technical faculties have been the direct results of the dissemination of knowledge by the university. Even the professor who has boasted that he never wittingly either learned or taught anything useful has been the servant of real learning by extending the limits of scientific knowledge which refuses to be hindered or circumscribed by its narrowest and most erratic votaries. Wherever there

has been a seat of learning, from that point has issued a quickening influence which has stimulated the growth of every form of useful activity. All the great industries on which the prosperity of every civilized nation is based, have originally sprung from the small beginnings which had their initial impulse from some branch of knowledge, acquired in the first instance at the university.

So closely are all forms of knowledge related in their fundamental elements that no one of them can attain to a state of real growth without carrying others more or less with it. This elementary principle which finds illustrations and the most conclusive proof in every field of educational experience underlies the fundamental organization of the university, and it completely justifies the place of the technical school in the university plan. Further than that, it illuminates in a clear and instructive manner the natural development of the institution of universal learning.

The ramifications of every branch of science reach a great variety of human interests many of which are directly affected by it, while others are more remotely touched. The full significance of every acquisition of knowledge can only be understood or even to a small degree appreciated by realizing the industrial activities or other real interests of the community which it affects. An isolated study of any one technical subject, or of any other subject, without regard to its relation to other branches of knowledge, would be excessively narrow in its results and probably as valueless as narrow, if indeed such a study be not unthinkable. The greater the number and scope of scientific or technical subjects brought within the range of instruction, the broader will be the whole amount of knowledge acquired, and the more complete and thorough will be the comprehension of any one of them. There is a limit to the number of subjects which can profitably be taken by any student in a course of proposed study, but there can be no question whatever that the instruction in any one subject will be enhanced in value in proportion to its breadth, or its reach into other and related or affiliated subjects.

The more complete the view of the field covered, the more satisfactory will be the student's work in it. In fact, it may be stated that the real study of any one part of the field of knowledge consists in acquiring information relating to its effect upon other fields into which it reaches. It is impossible to conceive of any subject of scientific study as an abstraction either from other subjects or from the material elements of experience.

The bearing of all these considerations on the place of the technical school in the university is most direct and essential. In the first place the instruction in any professional school of a technical character is an integral part of the whole body of instruction belonging to an institution of universal learning. It can not be given so effectively anywhere else as in the organization of which it forms a part absolutely necessary for completion.

The advantages gained by a technical school in a university environment are fundamental; they touch both its technical work and the general educational training which must precede the technical in any adequate course of study of a professional character. An engineering or other technical student pursuing his work in a university system finds himself in a stimulating atmosphere of study and investigation reaching far beyond the limits of his own field. He acquires largely by incidental or even unconscious absorption a broad cultivation by constant contact with active educational work, some of which is more or less affiliated with his and some

not. This association is an inspiration to a broader and more enthusiastic view of his own work in itself as well as a material enhancement of value of that work by disclosing its relations to other fields of learning, all impossible to attain outside of the university. These conditions give his educational training qualities that not only strengthen them and widen his subsequent professional practise but contribute most effectively to his intelligence and usefulness as an educated citizen.

More than this, the technical professions now demand of their members for the higher planes of successful practise the same general educational preparation for professional study as that required by the best law and medical schools. Without entering into a discussion as to the relative merits of the educational work done by the small college and by that forming a subordinate member of the university, it is sufficient to say that this part of a well-rounded course of professional study harmonizes completely with the university system and is in fact an essential element of it.

Both for technical efficiency, therefore, and for the broadest and best educational motives the technical school is bound to find its strongest development in an environment of universal study and investigation.

The university has long since lost the character, if it ever properly had it, of a place were abstractions of learning, separated from the things which only give them life, are to be dispensed after the manner of instruction to men who are never to deal with the affairs of life. It has come to be an intensely practical working agent. It is effective and worthy of support only in so far as it makes itself felt in the real life of the community. If it is to be a true and real center of instruction it is imperative that it shall carry knowledge into every useful calling, governmental, corporate or private. The time will soon come, if indeed it is not already reached, when it only can prepare men to administer and extend in a rational and moral way the great industrial activities which at the present time form the foundation of the material prosperity of the modern world.

The true student of the professional or technical school becomes heir to a comprehensive and clear understanding of his duties and responsibilities in his relations to his fellow men and to the community. Those duties and responsibilities present themselves to his trained mind in their real proportion. He is neither non-developed nor mal-developed in his judgment of affairs. His university training, especially in the technical school, has taught him accuracy and penetration in the analysis of any proposition confronting him, and that truth and knowledge must be sought with the directness of a plumb line. Science yields nothing but confusion to the shifty, devious and dishonest inquirer. The fundamentals of morality are the very stepping stones to technical success or professional attainment.

The opportunities offered in the administration of public affairs and the great corporate interests of the present time, rapidly increasing in number and magnitude, create almost irresistible temptations to prostitute them to selfish gain. The realization that great power, or what has now come to be its full equivalent, great wealth, is a grave and delicate trust, to which selfish gratification in its infinite and seductive variety is abhorrent, comes most naturally and easily through sound knowledge 'the beginning of wisdom.'

The correct conception of his duties gives to the professional man such a deep and true sense of his responsibilities as to render him the safest administrator of those great interests whose sinister power

has already threatened both the morals and the safety of the community. Selfish gratification is a temptation to which he may or may not yield, but his inheritance from the university translates wealth to be a means of accomplishing the highest means of life, and saves him from that narrow, common complaisancy of wealth which is the dry rot of character.

In this age of self-appointed erratic and dangerous regulators of society when an unreasoning and destructive discontent frequently prompts to crude measures whose real purpose is a blind upheaval of the existing order of things, the intelligence and the calm balance of the university man of affairs must be the corner stones of public safety. His trained mind taught to analyze and to test by the records of experience no less than by the precepts of science does not lose its poise before either the shallow plausibilities of the advocate of Utopia or the sinister deceptions of the revolutionary reformer or what has come to be nearly as bad, by the egoistic and blundering although much-applauded strenuosity of the present time. It is not to be supposed for a moment that every subject of university training will issue from its halls the ideal well-rounded citizen but judgment must be passed upon such matters in view of their resultant tendencies. A fair and careful scrutiny of the impress made through the professional schools of the university, from the older faculties of philosophy and theology to the modern faculty of engineering, upon the broad moral, governmental, professional and business affairs of the most cultivated communities of the world, conclusively confirms and supports these observations.

The creative or evolutionary influence of the university upon the community is exercised chiefly, and it will ultimately be exercised entirely, through its professional faculties, its faculty of philosophy already having become essentially a professional faculty of teaching, a character which it is bound fully to assume hereafter. This is the highest and ultimately the complete mission of the university. This means with absolute certainty that professional instruction shall be given not by closet professors, but by men who are students in the highest and best sense of the word, profound students not only of the abstract principles of their profession, but of the play and power of those principles upon the affairs of men. This knowledge must be gained by taking their full part in human experience and not by withdrawing from it. Their investigations must be made largely in the practical operations of their professions. In other words, they must be men of affairs as well as students. A living and forceful quality can be given to instruction in no other way whatever but by actual contact with the things encountered in practical experience and precisely in the relations disclosed by that experience.

Some of the professional faculties have already benefited by this quickening and energizing influence of living contact with their professions. The medical faculties are composed largely of eminent practitioners and it is not too much to say that it would be impossible to give the requisite instruction were it otherwise. It is well known that most serious defects in the present educational administration of the university faculties of law and engineering are due to the fact that too many instructors fail of that true development and broad training gained only by actual professional experience. It may be confidently stated that instruction in professional engineering subjects can not now be given with the necessary breadth and efficiency without supplementing the imperatively necessary work of the study by extended practical experience. And those ob-

servations are not peculiar to the faculties to which they are applied. The time has already come when the professional faculties, and preeminently so those of the technical schools, must be active, living parts of their professions. There is no other way by which they can either properly discharge their own functions or become members of a university organization strengthened and equipped to meet its wide educational responsibilities which make it one of the greatest conserving and elevating forces of the community.

The technical schools constituting the great modern professional schools of the university are integral parts of it and necessary consequences of its natural evolution. They belong to it historically and naturally. They are professional schools, and professional schools not only belong to the university, they are the university.

WILLIAM H. BURR.

THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE.
SECTION I—ECONOMIC AND SOCIAL SCIENCE.

THE address of the retiring vice-president, Professor Fisher, on 'Economic Science,'[1] was followed by an address of welcome by Professor Frank A. Fetter, ex-secretary of the American Economic Association, in which the work of the section was commended for its services in emphasizing the scientific method in economics in contrast with the conception which gave most attention to theoretical descipline.

The discussions of Professor Norton's paper (see below) by Dr. W. H. Welch, of Johns Hopkins, and Dr. A. C. Abbott, of the Philadelphia Board of Health, added materially to the value of this session. Dr. George W. Kober, of Washington, and Fred. L. Hoffman, of Newark, sent communications on this paper, the latter especially criticizing the proposals relating to federal control of medical institutions.

[1] See SCIENCE, August 31, 1906.

Economic Advisability of a National Department of Health: PROFESSOR J. PEASE NORTON, Yale University.

The salvation of the civilization and the race lies in the hands of exceptional men. The hope of the race inheres in their efficient organization for action. Organization consists in compelling voluntarily or involuntarily each individual to do that thing within his capability which has greatest value for society. To do otherwise is a great waste. To permit great wastes to go unchecked is more than a suicidal policy; for an evil more heinous than race suicide is race homicide.

There are four great wastes to-day, the more lamentable because they are unnecessary. They are preventable death, preventable sickness, preventable conditions of low physical and mental efficiency and preventable ignorance. The magnitude of these wastes are testified to by experts competent to judge. They play their part in a cruel devastating destruction that is almost incredible to the human mind.

The economic reasons for establishing a national department of health are five: (1) To enable society to progress more rapidly under the law of increasing returns through increasing the per cent. of exceptional men of each degree (many of whom are now lost through preventable accidents), in addition to increasing the total population. (2) To lessen the burden of the unproductive years on the productive years by increasing the average age at death. (3) To decrease the burden of death on the productive years by increasing the age at death. If the expenses of illness and death are $300 and the average age at death is forty years, the average death expenses average $15 on the twenty

productive years. Could the average age be increased to 50 years, the burden falls to $10 or a decrease of fifty per cent. For 80,000,000 of people, the saving of $1.50 per year of life would be equivalent to $120,000,000 per annum. (4) To lessen the economic burden of sickness. Assuming Newholme's figure of nine days average illness per annum, approximately 2,000,000 years of life are lost per annum. Estimating wages at $1 per day, and all other expenses $1 per day, $1,444,000,000 loss per annum is registered by this item. Could the days of illness be cut down one third nearly $500,000,000 would be saved. (5) Higgins has estimated that six hundred millions are now spent on criminality in the United States. If the criminality is largely the product of social environment, such as over-crowding, alcoholism, etc., measures which would decrease this only fractionally are worthy of consideration. A decrease of 16⅔ per cent. would result in savings of $100,000,000 per annum.

For the last four estimates, the total savings range between $1,800,000,000 and $4,000,000,000 per annum. In addition to the positive gain, in addition to the savings above, there exists a vast amount of misery and sorrow which would be lessened, but may not be measured by statistics.

How Shall the Destructive Tendencies of Modern Life be met by the Individual? Dr. Richard Cole Newton, Montclair, N. J.

First of all a physical education is needed to develop, strengthen and preserve the body. In spite of mechanical and scientific advance, we are far behind in respect to the rules of simple and healthful living. A systematic study of diet, use of narcotics, employment of exercises as they apply to 10,000 people for ten years would settle many fundamental questions which nothing short of government could successfully undertake to solve. A national bureau of health should be formed to undertake such studies and experiments as are necessary to make these inquiries. This bureau should pass on every new remedy and every proposed system of treatment, so that the humblest citizen might know that he will not injure himself in using such remedies or systems of treatment. By positive direction and training the Japanese have made their armies invincible. We must profit by their example if we would maintain our national life and our racial preeminence.

Limitation of Great Fortunes: Professor James Walter Crook, Amherst College, Mass.

The problems connected with the amassing of enormous fortunes have been given a special importance by President Roosevelt's Washington address, on April 14. The remedy by him proposed was a progressive tax so framed as to prevent giving or beqeathing fortunes, over a given amount, the tax to be imposed by the federal government.

Unlimited opportunity to accumulate fortunes has a selective value by attracting a large share of the best talent into business. A change would affect commercial activity as a pursuit. It would create a new source of federal income and greatly modify the distribution of wealth in the community.

We must remember that the wealthy in large measure manage their wealth for society. Before radical action we should consider whether the growth of large fortunes is due to temporary or permanent causes.

The causes of great fortunes are, as a rule: (1) underground resources (mining, oil, etc.), (2) development of transporta-

tion facilities, (3) combination of corporate enterprises, (4) increase in land values, (5) speculation in corporate securities, (6) monopoly. All except the second and the sixth are still open fields for the fortune maker.

Possibly something, not much, may be expected as a remedy from seeking an honorable family name, from public service, but the remedy is too remote.

Of the three methods proposed: (1) An arbitrary limit to accumulation, (2) progressive income tax, and (3) progressive inheritance tax, the first is arbitrary, the second no less acceptable, and the third is good for raising revenue but doubtful as a means of repressing accumulations.

A tax heavy enough to accomplish the purpose would raise problems of fiscal administration of a perplexing character, both in the collection and use of the funds. Economically, such a tax would repress industrial activity, financially it might cause extravagance in governmental expenditure and disturbance of the money market by its collection.

On the subject of agriculture the introductory talk of Professor L. H. Bailey, of Cornell, on the 'Problems of Agriculture,' and the paper by Professor G. N. Lauman, on 'Rural Conditions and Problems in Europe,' were timely and full of suggestion in the service of American experience.

Professor Bailey said: The farm is going to be laid out by the rural architect with regard to good taste. We shall begin with the highways and take down the advertising signs among the first. Sanitation will play a larger part. Even now many of our best dairy stables are more truly sanitary than the majority of homes in city or country. The rural home must solve its servant problem (1) by simplifying its food preparation, and (2) by reduction of labor with mechanical appliances.

Causes and Consequences of the Past Ten Years of Agricultural Prosperity in the United States: GEORGE K. HOLMES, U. S. Department of Agriculture.

The prosperity of farmers, which has been preeminently in evidence during the last half dozen years, must be and is logically reflected in the higher capitalization of their lands, and in better and additional buildings and other improvements. It has been ascertained by the U. S. Department of Agriculture that the farm real estate of the United States increased 33.5 per cent. in value during the five years following the census of 1900, or an amount that averaged $100,000,000 a month and equaled $6,000,000,000.

There has been a cessation in recent years of the longtime tendency to overproduction; there is no more cheap cultivable land of nation, state and railroad to be robbed of its fertility for cheap production. The agricultural population is becoming a smaller fraction of total inhabitants, and there is a nearer approach to equilibrium between agricultural production and consumption, helped by enormous exports of cotton, grain and meat. In the meantime, immigration, which had long poured its hordes upon the farms, has changed in character and been diverted to the cities, to consume instead of multiply the products of the farm. Besides, the consumption per capita of some things seems to have increased—of wheat, meat and its products, vegetables, fruit, poultry and eggs.

These are among the chief causes that are making agricultural consumption tend to push agricultural production, with the result that prices have risen and farming operations have become more profitable.

The greatest economic gain that the

farmer has made, apart from higher prices, is the freedom to shift from one crop to another, the most conspicuous illustration being cotton. Now that the planter is not generally working against a crop lien bearing 40 per cent. interest and profit to secure advances for living and production and has no creditor who will lend on no security but cotton, he is in a position to raise cotton or some other product, as he pleases, and there will never be an excessive crop of cotton again, unless by chance for one year, as in 1903.

Among other results of prosperity, are the ability of the farmer to borrow at a low rate of interest, his enormous accumulations, deposits in banks, and investments, the cancellation of old farm mortgages, and his ability to hold his crop after harvest until the price is satisfactory to him, in place of dumping it upon the market as he formerly did to pay debts and expenses. The farmer now has an impregnable economic position.

Economic Geography: Dr. J. Russell Smith, Wharton School, University of Pennsylvania.

Economic geography is a study of the world in which we live as a place in which to make a living. Another way of putting it is that it is the description of lands in terms of human usefulness. This phase of geography does not permit itself to be carried off into speculation of purely scientific interest unless there is also an economic aspect. It is held down by that qualification of human interest—usefulness to man.

Almost every industry and every form of human activity is controlled by the physical conditions of the land in which the people live. The understanding of these relations is economic geography, and it is one of the shortcomings of our educational system that this study has not received greater attention.

Economic geography needs to go into higher education in as thorough a way as has been the case with history. It is useful not only to other sciences but to the direct preparation of the individual for citizenship and business.

The concept and treatment of history have been rapidly changing because of the growing recognition of the part that economic conditions have had in shaping human affairs. The understanding of the past and the present are alike in their requirements. The science of economics, like history, requires for its understanding the fundamental facts of economic geography. Economic geography gives the economic facts that are requisite to an understanding of economic theory. Many of the problems of political science also grow out of geographical conditions.

Private industry and investment also depend closely upon the information given by economic geography. Twenty years ago there was a great rush of emigrants into western Kansas. They were unfamiliar with the economic geography of the region and a quarter of a million of them attempted to make farm homes where it was impossible to do so. They were driven out bankrupt after years of labor, and eastern mortgage holders also lost millions. Economic geography is quite as important to the financier as to the representative of industry or government.

On the general theme of municipal ownership four papers were presented. That by Charles W. Tooke (Syracuse, N. Y.) dealt with legal and financial phases of the problem. The discussion was opened by Charles Whitney Baker of the *Engineering News*, New York City, who said:

The 'public utilities' in cities at the present day are absolute necessities; hence

their control or operation by the public authorities is a far more vital question than it was twenty years or even ten years ago.

There have been three important changes in the public point of view of the municipal ownership question: First, the enemies as well as the friends of municipal ownership are now agreed that public utilities, if not owned by the city, must be operated under strict franchises, providing for good service and regulation of rates and limited in duration.

Second, all are agreed that 'public utilities' are natural monopolies and that attempts to create competition in the gas, water or electric supply are in the long run injurious, both to the stockholders and to the public, and hence should not be permitted.

Third, the recent disclosures of inefficiency, corruption and wholesale graft in some of the private corporations which the public has been accustomed to regard as models of good business management, has enabled people to make a fairer comparison between municipal work and private work. Public utilities in most cities are and must be operated by large corporations, unless the cities themselves take charge. In these corporations, there is and will inevitably be more or less red tape, inefficiency, graft and corruption. It probably still remains true that this corporate management will generally be more efficient than city management, but the difference is far from being as great as has usually been supposed.

Public Ownership and the Wage-Earners: H. T. NEWCOMB, Washington, D. C.

In its efforts to convert municipal, state and national governments to particular portions of its socialistic program the persistent propaganda of public ownership, whose tireless activities so visibly pervade current American politics, usually demands the support of wage-earners upon the ground that the employees of public enterprises will be more favorably treated than those of private enterprises in the same field. It is claimed that public ownership means higher wages; shorter hours of labor, and, generally, better conditions of employment.

Experience proves not only that the government is not the best employer, but that it is not even a fair employer. Nor is this all. When government engages in industry on a large scale the condition of its employees naturally and inevitably degenerates to that of slavery.

Government does not advance wages with the increased cost of living.

Democracy is an arbitrary employer. Public employees must not seek to better their condition, on penalty of discharge, according to President Roosevelt's order of January 31, 1902.

Compulsory labor in New Zealand (Parsons, 'Story of New Zealand,' p. 179 seq.) gives no hope to labor for freedom under government employment.

The public employer has neither the knowledge of labor conditions, nor the incentive to efficiency which springs from the demand for pecuniary success. As truly as republics are ungrateful, the majority is sure to prove harsh as a task-master, and grudging in yielding compensation to its servants. Its enthusiasms are usually, not always, toward generosity, but they are changing, remittent and unreliable, while its sterner morality produces an ideal of justice that inspires the niggardly legislator while he crushes, in the ostensible interest of the taxpayer, every proposal to deal fairly and, therefore, wisely with the problems arising out of the public employment of labor. More than this; democracy, or the majority, through which it operates, is intolerant of disagreement with its principles, relentless in beating down opposition to its policies, merciless to the minority

which persists in impeding the execution of its will. What could such an employer be, in dealing with labor on a large scale, save a harsh task-master? What could it naturally become save a driver of shackled slaves? Where is the clear-headed and independent wage-earner who will consciously invoke such tyranny?

Fallacies of Municipal Ownership: Allen Ripley Foote, Secretary State Chamber of Commerce, Columbus, Ohio.

The most beneficent service a government can render the people is to correctly regulate, not to own and operate, public service utilities. Every gain made in reducing prices for services charged to the people by eliminating the political elements of the costs of ownership and operation paid by corporations, can be eliminated by placing corporations under a correct system of regulation, and granting them, without charge, every privilege enjoyed, without payment, by the municipal corporation.

Politicians now take advantage of corporate mistakes to make promises of better service. They make a show of keeping their promises to the people, by the simple process of not charging into the account numerous items all of which are paid by corporations and must be covered by prices they charge for services rendered. The apparent gains sometimes shown by municipal ownership advocates in the department of economic costs, on close analysis and inspection are invariably found to be the products of political book-keeping, and an unsound financial policy. These include the payment of the interest account on bonds out of the tax-payers' money and charged to general expense, instead of to the operating expenses of the utility; no insurance, with losses by fire to be paid out similarly; no account taken of depreciation.

Economic gains are thus shown, but not made. Such gains must be earned, they can not be created by a fiat resolution. Instead of making savings for the people, municipal ownership has resulted in hampering, restricting and deadening all enterprise and improvement in the industries it has absorbed, and in placing heavy burdens upon the tax-payers.

Correct regulation would require all corporation accounts to be kept in the form prescribed by the state for the information of the people. There would be an end of watered stock; wars between competing corporations would cease; operating costs would not be inflated by charges for franchises and property taxes; prices charged for services would be true economic prices.

The Corporate and the Individual Conscience: Cora Agnes Benneson, LL.B., Cambridge, Mass.

Within the last decade great changes have taken place in business management. From individuals it has passed to corporations, composed of individuals, to be sure, but they must now consider corporate instead of personal interests; they have, or should have, a corporate conscience.

Granted, that although a corporation proverbially has no soul, it has a corporate conscience. Who is responsible for that conscience, the stockholders, the directors or the state?

On measures involving public welfare, the state conscience should be on the alert. If a corporation corners a necessary commodity, like wheat or coal, or unduly cheapens labor, it is dangerous to the republic and the state should take away its charter. State laws should be passed protecting minority stockholders.

The directors are responsible for the corporate conscience, when they resort to double-dealing, as for instance privately giving lower railroad rates to certain corporations than to individuals, or exploiting the corporation for private ends. The

remedy lies with the stockholders to put such out of office. Stockholders are responsible for the corporate conscience when they permit corporate measures they would not personally sanction.

Few stockholders attend annual meetings. If they absent themselves, what right have they to complain that the directors are self-elected and a small number or even one gains control? Attendance gives opportunity to ask questions; the more searching these are, the more welcome are they to directors who have nothing to conceal and who have kept the corporate conscience clean.

The Public Bath System of Brooklyn: WILLIAM H. HALE, Brooklyn, N. Y.

A system of free public baths is a most important and beneficent exercise of municipal ownership, conducing as it does to public health and ultimately to improvement of public morals.

The floating baths have long been in use along the river front during the summer season; three of these dating back nearly or quite thirty years are still in commission; two more were built in 1897, and the five are now open to the public. It is estimated that 1,500,000 people used these baths last summer.

The system of interior baths open the year around is very recent. Six have been opened thus far.

These baths provide shower baths, with hot and cold water, free to all. Soap is provided at a cent a cake and use of towels for a cent. Tubs in private rooms with soap and use of towel, cost five cents.

Great care is taken to keep the bath houses well cleaned, and this is so well done that many of our good citizens use the public baths, and many persons regularly come from New York to use them.

Receipts for soap, use of towels and use of tubs in 1905 were $4,446.75. The estimated attendance during 1905 was 6,000 a day.

The cost per capita of each bath for the Montrose Avenue bath for April, 1906, was 3.42 cents. The number of bathers for this month was reported as 47,956, and the cost of operation of that bath above receipts for that month was estimated at $1,594.01. This does not include the cost of the water used nor any estimate to cover rent for the building, but merely operating expenses.

And it is indeed doubtful whether public funds can in any way be better expended than in the cleansing of the people by these baths, in promoting health and comfort, and in its generally ameliorating effect. It is the testimony of the attendant in charge of the bath which we have just been discussing that it has a distinctly perceptible effect not only in improving the health, but also in elevating the moral tone of the community in that immediate neighborhood.

Regulation of Freight Rates: N. T. BACON, Peace Dale, R. I.

The railroads legitimately object to freight charges based on mileage only, that in many cases, and especially for short distances, haulage only represents a minor part of the cost to them, being of less importance than switching, and the use of terminals and rolling stock. To meet these objections rates are proposed based on three subdivisions of the charge:

1. Terminal charges for switching and use of terminal facilities. For this all stations should be graded, according to annual freight receipts, into say six classes, terminal charges to be uniform for each grade of stations for the different services rendered at each end.
2. Use of rolling stock.
3. Haulage.

All these should differ for the different classes of freight, but all rates and gradings should be published, and no modification

allowed without publication a month in advance. Charges should be only for services rendered, so that in case of concerns owning their own sidings and doing their own switching, terminal charges would be eliminated for that terminal, but not at the other unless the freight received such treatment at both ends. Similarly no charges should be made for rolling stock against firms providing their own cars, except that where they are returned empty a suitable published rate should be made for this. These are the legitimate advantages of wealth, but no illegitimate advantages such as exclusive contracts should be tolerated. Those already existing are probably ultra vires for common carriers and therefore void.

Freight classification should be left to periodical conventions of general freight agents. It is too complicated for any other treatment.

Finally, the railroads should be liable for demurrage for unreasonable delays, on a basis similar to that on which they charge demurrage for delay in unloading. Some allowance should be made for extraordinary demands; but favoritism should be drastically punishable, and the president or directors of a railroad should be personally responsible for the shortcomings of subordinates, without exonerating these. Moreover, those finally responsible should be under heavy bonds and not at liberty to avoid suit by taking refuge abroad. Our laws should be altered, to allow an action *in rem* instead of *in personam* in the case of any fugitive from justice who does not return on publication of a summons. There are few greater scandals than those of wealthy men abroad defying our laws while they depend on them for the enjoyment of the income of their property.

The Problem of Railroad Taxation: Herbert N. Edwards, Yale University.

The modern industrial corporation has found its chief field of operation in transportation which is the life of industrial development. In the United States methods of assessment and collection of taxes on these properties are so varied as to be confusing. But in principle there is more uniformity. Forty-seven out of fifty states and territories tax their railroads on the basis of physical valuation. The general property tax still obtains nearly everywhere, but by methods differing from that used in taxing individual property. The method in most common use is the state board of assessment and collection. The average value per mile is the valuation basis to which any given rate is applied. But valuation is in some cases not that of use and personal property but of the stocks and bonds (Delaware, Pennsylvania, Massachusetts, New York) supplemented by gross receipts tax.

Railway taxes are now the chief source of state revenue in many cases, leaving the general property tax to local divisions. In Michigan the basis is the sum of values of the tangible and intangible property. Plehn advocates the value of their securities as the best basis and Seligman the taxation of net receipts. The states now derive $60,000,000 revenue from this source. Their methods are, however, inadequate and some form of federal control is needed for the sake of more harmonious methods.

What may Accounting teach Economics: Frederick A. Cleveland, New York.

To the economic dogmatist and abstract reasoner who conceives economics as composed of a set of specific doctrines as expounded by the physiocrats, the Malthusians or the Marxians, or as embraced in a congeries of concepts known as the abstinence theory of capital, the marginal theory of rent, the residual theory of labor, the quantity theory of money and the utility

theory of value—to these accounting can teach nothing.

On this conception of economics, after a century of research and discussion, Professor Hollander holds that we have not as yet developed any scientific conception of industrial society. Many others agree with him. Economics as a branch of science is rather concerned with *the group activities of man toward individual and social gain.* The point of view is that (1) of economic factors, (2) of economic relations (*a*) to the material world and (*b*) to institutions both social and economic, and (3) the forms of economic income, including private and public incomes.

Already considerable progress has been made in this direction by others than economists, especially by the student of history and public law. Scientific economics considers data as related to (1) organization, (2) problems of administration, and (3) methods and technique. We must lay aside dogma and classify data to get an intelligent grasp of affairs.

Accountancy is to scientific economics what the clinic is to medicine. The examination made by the professional accountant is for purposes of prescription. A record of the diagnosis, of the prescription, of the remedial result, and of the history of the performance of normal physiological functions recorded in the accounts, may be taken as the data upon which broad scientific generalization may be based; this broad generalization should be made by the economist.

Structure of Cities: RICHARD M. HURD, President, Lawyers' Mortgage Company, New York.

Cities grow and conform to economic law. The point of origin is that of contact with the outer world. In its organization from 40 to 70 per cent. of the area is used for streets, the balance is devoted to three uses: Business, residences and public buildings. The distribution of business utilities is purely economic, land going to the highest bidder. Residence areas are based on social considerations. Growth is axial or central—around centers or around the circumference.

Central growth has two main aspects; first general growth in all directions from the point of origin and second local growth around subcenters within the city, such as transportation termini, public buildings, exchanges, factories and hotels. As a city grows the centralizing influence of public buildings steadily diminishes while its exchanges assume increasing importance, these varying in character according to the leading business transacted in the city. Normal growth consists of the gradual aggregation of buildings of the same character due to the gregariousness of mankind and the saving in time from the close juxtaposition of buildings. Continuity is a vital feature of all growth, whether central or axial, every break causing a weakness in the structure similar to the loss of a link in a chain. An internal movement which constantly goes on is the gathering together of similar forms of business into special districts.

There are three main causes of changes in a city's structure; increase of population, increase of wealth and new transportation facilities. Increase of population without increase of wealth would normally tend only to a gradual extension of buildings of the existing character over a larger area. Increase of wealth, however, causes continual rebuilding within the city, old-fashioned shops, dingy offices and plain residences being supplanted by buildings of a new standard of magnificence. New and improved methods of transportation draw residences beyond the city's limits, concentrate business in higher buildings at the center and establish new axes of travel as

additional vertebræ for the city. More and more in the life of great cities is improved transit of importance, the tendency being for traffic to mass at intersecting points with inferior utilities in the quiet side streets.

Insurance Problems relating especially to the Management of Assets and Legal Regulation of Investments: Dr. Lester W. Zartman, Yale University. (To be published elsewhere.)

The New York insurance investigation revealed the dangers and abuses in the management of insurance assets. As a result stricter legal regulation has become necessary. The evils of insurance fund management are of three classes: (1) Officers and trustees made personal profit out of the company's funds; or (2) they took no interest in the disposition of the funds, and (3) the policy-holders to whom the funds belong exercised no control over their property.

Stricter limitation of the investing powers of officers and trustees has not proved an adequate reform. It has rather produced abuses, such as collateral loans and trust company deposits, both of which should be given up.

The vulnerable point in insurance is the making of personal profits by officers and trustees. Making this a penal offence would tend to divorce insurance management from other lines of business. Stock insurance companies should be forbidden, because of the danger of stock control, and real mutuality secured. Abolish the proxy system and provide voting of policy-holders by mail for boards of managers are in the right direction. More reliance should be placed on the election of responsible directors than in strict legal regulation.

Mathematics and Formal Discipline: Joseph V. Collins, State Normal School, Stevens Point, Wis.

In the training of the reasoning powers the service of that faculty in social and economic science is to be considered. Professor Lewis (Dartmouth) in his study of formal discipline by tests in geometry and practical reasoning (*School Review*, April, 1905) shows that a relationship exists but does not prove the faculty theory true. Tables prepared by the author of the present paper show that what a student does in any subject depends more on his mental equipment and native environment than on the particular matter considered.

Mathematics gives a training *sui generis*. In arithmetic the problems correlate at many points with the actual affairs of life. Speaking broadly, though the most important effects of the mathematical training are abilities of quite general application: as, holding a number of particulars in the mind at one time, training in sustained reasoning, habit of overcoming difficulties, recognizing the universality of the application of correctly stated laws, perceiving the need of care to secure the accuracy of results required, and so on. These powers have identity of qualities with multitudes of activities the individual finds himself engaged in in after life. They thus furnish hooks on which to hang new experiences and conquer new problems. In these ways perhaps more than in any others mathematics justifies its place in the course.

The following papers were read by title or in abstract:

Conditions and Needs of Southern Agriculture: Professor Andrew M. Soule, Blacksburg, Va.

Labor Conditions in Southern Farming: Professor F. W. Massey, Raleigh, N. C.

Value of an Organized Working Force in Industry: President E. L. Blackshear, Prairie View, Texas.

Restriction of Telegraph Development Under Monopoly Control: ROMYN HITCHCOCK, New York.

J. FRANKLIN CROWELL,
Secretary.

SCIENTIFIC BOOKS.

The Vegetation of the Lamao Forest Reserve. By H. N. WHITFORD. *The Philippine Journal of Science,* Vol. I., No. 4, pp. 373–432, pls. 1–27, with map; May, 1906; and Vol. I., No. 6, pp. 637–682, pls. 28–45; July, 1906.

This paper embodies a careful descriptive account of a large body of virgin forest near Manila, in the study of which the author has carried into the tropics the precise methods of temperate forestry and the viewpoint of physiographic ecology as developed by Cowles. The Lamao Reserve occupies an area of 4,426 hectares on the eastern slopes of Mount Mariveles, which is located in the center of the peninsula which forms the northern mouth of Manila Bay. The reserve runs from sea-level up to 1,406 meters altitude and presents throughout an erosion topography. The climate of the region is shown to possess a marked dry season from December to April, with copious rains in the remaining months; the annual curve of humidity follows that of rainfall and the temperature is rather constant with an annual mean of 36° C. and an annual mean range of 3.4° C.

The forest is midway in character between the evergreen hygrophilous forest and the monsoon forest, differing from each in having an intermingling of evergreen and deciduous trees. The author distinguishes six types of forest formation in his area with distinctions due to differences of altitude and the attendant change in climatic conditions: (1) The Strand, which is found to agree closely with that described by Schimper for the Indo-Malay Peninsula. (2) The Bambusa-Parkia formation, characterized by an open stand of trees many of which are leafless throughout the dry season, and by pure and mixed growths of several species of bamboo, which are in effect partly deciduous. (3) The Anisoptera-Strombosia formation inclines less to the monsoon type, as it contains no trees which are leafless throughout the dry season; bamboos are here replaced by small dicotyledonous trees; the specific make-up of the forest is very complex. (4) The Dipterocarpus-Shorea formation exhibits an almost complete absence of deciduous trees and a simpler floristic make-up than the formations at lower altitude. Here the variations due to differing physiographic situation begin to be manifest. (5) The Shorea-Plectronia formation lies between 400 and 900 meters altitude and has a more hygrophilous climate than the last formation with a more abundant representation of pteridophytes and bryophytes. The instability of the substratum in this formation and the next prevents as rich a development of the forest as the climate would lead one to expect. (6) The Eugenia-Vaccinium formation lies above 900 meters altitude and is characterized by a very humid and cloudy climate together with high winds. The forest is here xerophilous and stunted on the ridges, although more hygrophilous in the ravines and depressions. Epiphytic vegetation abounds and liverworts and filmy ferns are common. Many genera are represented in this formation which are common to tropical mountains throughout the world or even to the temperate regions.

In the Bambusia-Parkia formation a study has been made of the clearings, known as 'parangs,' and the return of these areas to the climax forest. Some six types of parangs are characterized, in each of which the flora is poorer than in the original forest, and may consist largely of comparatively pure stands of certain small trees or may be occupied by the climbing bamboo *Dinochloa.* In each of the formations a detailed enumeration of the forest trees has been made in several plots on different soils or in different physiographic situations. The summation of results for six plots in the Anisoptera-Strombosia formation, aggregating 5,850 square meters in area, shows a total flora of 99 species. Of these the five most abundant form but 35 per cent. of the total and 64 are represented by three individuals or less. In another series of seven

plots in the same formation 120 species were found of which the five commonest form 30 per cent., and 91 form each less than 1 per cent. Quite as striking as the wealth in species and the poverty in individuals is the variation between the different plots in the same formation.

Note has been taken of the lianes, epiphytes and herbaceous vegetation, and many valuable observations made on the foliage, bark, latex, buttresses and cauliflory of the trees. It is unfortunate that more attention could not have been given to the herbaceous vegetation.

The paper as a whole, with its abundant illustrations, gives a vivid picture of the vegetation of a region not before well known to us. Manifest importance attaches to the carrying into the tropics of the detailed and comprehensive methods of studying vegetation which have been in use in the temperate regions. The fact that our methods and our points of view are both the products of the study of temperate vegetation must compel care in the application of these in the tropics. While the method of the study of plots gives interesting results as to the wealth and composition of a tropical forest when first applied in a particular region, yet it does not give facts of the same order as those ascertained by the study of plots in the temperate zone, as may be seen by a comparison of the lists for plots in the same formations in the Lamao reserve. The reviewer doubts if the term 'climax forest' is one that would have come into existence if the first students of physiological plant-geography had resided and worked in the tropics. The term is certainly an extremely elastic one as used by Dr. Whitford.

It is greatly to be hoped that we may have in the near future further papers of this nature from members of the botanical and forestry staffs of the Philippines.

Forrest Shreve.
The Woman's College, Baltimore.

SCIENTIFIC JOURNALS AND ARTICLES.

Bird-Lore for September-October contains a well-illustrated article on 'The Home Life of the Red-tailed Hawk,' by Robert W. Hegner; an account of 'The Nesting of the Arctic Three-toed Woodpecker in the Adirondacks,' by Lawrence Achilles; an article on 'The Rose-breasted Grosbeak,' by Frederick L. Holtz, and one on 'The Habits of the Black Vulture,' by A. A. Saunders. W. W. Cooke contributes the eighteenth paper on 'The Migration of Warblers.' In notes and news are the records of two plume sales in London, footing up over 35,000 birds, including 19,000 birds-of-paradise. The Audubon leaflet is devoted to the blue jay.

The Zoological Society Bulletin for October has an article, with a good illustration, on the African pigmy Ota Benga, and there are good papers on 'The Collection of Reptiles,' 'How Seals are Trained,' 'The White Peacock' and 'How Birds get Their Food.' The capture of two tarpon in New York Bay is recorded and there is a description of a new sea-horse from Bermuda to which the name *Hippocampus kincaidi* is given. Judging from the figure, it should belong in another genus. There is probably a slip of the pen in the statement under the cut of 'One of the Largest of Our Tortoises' that 'The growth of this specimen has been so great as to oppose the theory of the great age which these reptiles are supposed to attain.' What is doubtless meant is that great size does not necessarily mean great age, for these tortoises have been known to live over one hundred years.

The Museum News of the Brooklyn Institute Museums for October begins its second volume with a brief summary of the summer's work. In the section devoted to the Children's Museum is a good account of Tadourac and the Saguenay River, in which the occurrence of the killer, *Orca,* is noted. The museum has a living specimen of *Hyla andersoni.*

SOCIETIES AND ACADEMIES.

THE ST. LOUIS CHEMICAL SOCIETY.

The first meeting after the summer recess of the St. Louis Chemical Society, was held on Monday, October 8. A report 'On the National Pure Food and Drug Law, and On the Recent Hearing by the Official Commis-

sion in New York City,' by Dr. C. E. Caspari, attracted a very full attendance of members and invited guests. Dr. Caspari had attended the sessions of the commission as a representative of two firms of New York City, hence his communication had all the interest of personal knowledge. A rather lively and prolonged discussion of the subject from the chemical and pharmaceutical point of view manifested the interest of the members in subject matter of the law and the law itself.

C. J. BORGMEYER,
Corresponding Secretary.

THE ELISHA MITCHELL SCIENTIFIC SOCIETY OF THE UNIVERSITY OF NORTH CAROLINA.

THE 167th meeting of the Elisha Mitchell Scientific Society was held in the main lecture hall of the new Chemical Laboratory on Tuesday evening, October 9, at 7:30 o'clock. The following papers were presented:

PROFESSOR COLLIER COBB: 'Geology and Forestry in the Ducktown Region.'

MR. HAMPDEN HILL: 'Deforesting of the Ducktown Region by Sulphur Fumes.'

PROFESSOR CHAS. H. HEBTY: 'The Electric Smelting of Iron Ores.'

DISCUSSION AND CORRESPONDENCE.

'AN IGNORED THEORY OF THE ICE AGE.'

IN SCIENCE (October 5, page 439) there is a communication from Dr. J. M. Schaeberle, under the above title, of which the following is the opening paragraph:

> Looking over the recently issued work on 'Geology,' by Professors Chamberlin and Salisbury, I was surprised and disappointed to learn that in this voluminous publication of nearly two thousand pages, many of which are devoted to considerations of causes leading up to the ice age, the name of Dr. Marsden Manson is not to be found.

We, in our turn, are surprised that before going into print with this statement, Dr. Schaeberle did not consult the index of the work in question, where, in its appropriate place, he might have found:

> Manson, M., cited, iii, 445.

Referring to the page named, he would have found a section devoted to the cloud hypothesis and the wind hypothesis. Under the cloud hypothesis the following references are given:

> Manson, *Am. Geol.*, Vol. XIV., 1894, pp. 192–194; Vol. XXIII., 1899, pp. 44–57; and Vol. XXIV., 1899, pp. 93–120, 157–180, 205–209.

The discussion was, to be sure, generic rather than specific, and was directed toward the evolution of hypotheses concordant with the present state of discovery and inquiry, rather than retrospective. It was no part of the policy of the authors in preparing the work to bring up the specific views of an individual writer only to throw them down, unless wide acceptance required their consideration. Especially did the authors endeavor to avoid the adverse criticism of individual views when the ground had been adequately covered already by generic treatment. They, therefore, saw no sufficient reason for reciting and criticizing the special view of Dr. Manson that the earth, from the Archean to the Middle Tertiary, was shrouded in a mantle of clouds so deep, dense, universal and persistent that the sun had no effective differential influence on the temperature at the earth's surface, which was maintained by internal heat, and his conclusion that the Pleistocene glaciation was an incident of the transition from this cloud-shrouded era to the present one and was hence the only true glacial period. The authors had recited with care the evidence that there were other and much earlier glaciations whose extent and character raised even more exacting climatological questions than the Pleistocene glaciation. They had cited, in their appropriate places, the paleobotanical evidences of open and varied skies and diversities of atmosphere, specifically noting that the upper sides of leaves of different genera even in Paleozoic times were provided with palisade cells as a protection against too great intensity of sunlight. They had discussed at length and repeatedly, in the proper places, the great evaporation deposits and their associates, together with the related evidences, both physical and organic, of wide-spread and recurrent aridity, with its obvious implication of open and diversified skies and of effective solar action. It had been specifically pointed out

that in the elucidation of the Permian climatological problems which have now become the climacteric ones, no appeal could be taken to a supposed final refrigeration, or to any declining stage or senile condition of the earth, and that hence all hypotheses which involve such features had been set aside by the advance of discovery. There appeared, therefore, no good reason for calling up specifically Manson's theory merely to say that it had been put out of court by the progress of geological inquiry, especially as the recital of the results of inquiry, and their necessary implications, had already told the tale for themselves.

T. C. Chamberlin.

University of Chicago,
October 8, 1906.

Correspondence Relating to the Survey of the Coal Fields of Arkansas.

To the Editor of Science: I enclose herewith copies of the correspondence between the Director of the U. S. Geological Survey and myself regarding a matter of far-reaching importance to the geologists and other scientific men of this country.

A word is necessary by way of introduction: I was state geologist of the state of Arkansas from 1887 to 1893. One of the first things undertaken by the survey under my direction was a report upon the coal fields of that state. The work was under the immediate direction of Arthur Winslow, a graduate of the Massachusetts Institute of Technology, for some years assistant of the Pennsylvania survey in the anthracite regions and later for several years state geologist of Missouri. Mr. Winslow was assisted by several competent men, among whom were Professor Gilbert D. Harris, now state geologist of Louisiana; Dr. C. E. Siebenthal, now assistant on the U. S. Geological Survey; H. E. Williams, until lately chief topographer of the S. Paulo Geological Survey in Brazil; J. H. Means, consulting geologist, London, England; and Dr. J. F. Newsom, now professor of economic geology in Stanford University. In 1888 a preliminary report on the coal was published, but the final report was completed later. Owing partly to interruptions and delays that are here irrelevant and partly to lack of funds for the purpose, the final report on coal was not published up to the time I left Arkansas. Efforts were made from time to time to have the legislature provide for its publication, but it was never printed, in spite of the fact that it was economically the most important piece of work the state survey had done. Finally, in 1902, I suggested that the U. S. Geological Survey publish the report, and this was agreed to on condition that the maps of the coal region be reduced to a scale of two miles to the inch and that the contour interval be changed from twenty feet to fifty feet. To this I would not consent because the matter was one of too much importance to the people of Arkansas. Thereupon negotiations came to an end. Later I called the attention of U. S. Senator James P. Clarke, of Arkansas, to the importance of having this coal report brought up to date and published on a scale of a mile to the inch. Shortly afterwards I received the following letter from the director of the U. S. Geological Survey. The rest of the correspondence is self explanatory.

J. C. Branner.

U. S. Geological Survey.
Washington, D. C., Jan. 31, 1906.

Dr. John C. Branner,
Stanford University, Cal.

Dear Sir: There have recently been made several urgent requests by parties interested in the Arkansas coal field for a geological resurvey of that region. The persons making the request claim that since your survey of the field old workings have been extended, many new mines have been opened, and the region has been thoroughly prospected with the diamond drill. This development work has given more definite limits to the workable coals in areas heretofore mapped as coal-bearing, and has shown that workable beds occur in areas not hitherto recognized as containing coal. It is further urged that the coal of this region is becoming of such commercial importance that the United States Geological Survey should enter the field, assemble the data at hand, and make a very thorough and detailed survey of the region.

In view of the above conditions it seems desirable to take up this work in the near future.

Before doing so, however, I wish to lay the plans before you and ascertain if it is not possible to make some arrangement whereby the work done by you as state geologist of Arkansas can be utilized.

As a basis for practical cooperation the following plan is suggested,

1. That all notes and maps in your possession pertaining to the Arkansas coal field be turned over to this Survey for use in the proposed investigation;

2. That this material be used by the geologic parties so far as practicable in making a careful resurvey of the field, special attention being given to the economic features, and

3. That the results of this work be published by the United States Geological Survey in such form as may be decided upon, with the geology either shown upon the topographic base, upon the scale of 1:62500 as at present engraved, or on some reduced scale.

It will be understood that in all reports dealing with this region full credit shall be given to you and to the Arkansas Survey for the geologic material furnished by you and used in the resurvey, as well as for the topographic base maps prepared by this Survey under a plan of cooperation adopted in 1890.

Should this plan meet with your approval, kindly let me know at your earliest convenience, as preparations are being made for beginning field work in the early spring.

Very respectfully,

CHAS. D. WALCOTT,
Director.

(Sub-signature C. W. H.)

STANFORD UNIVERSITY, CAL.,
February 9, 1906.

HON. CHAS. D. WALCOTT,
Director of the U. S. Geological Survey.

Dear Sir: I have your letter of January 31 (C. W. H., M. R. C.) regarding a resurvey of the Arkansas coal fields. It goes without saying that I shall be glad to cooperate with the survey in this matter.

Having planned, directed and done a large part of the work in the coal regions of Arkansas, having carefully preserved and guarded the results of the survey since it was suspended, and having made several later trips to different parts of that region, I am naturally deeply interested in its geology and in the publication of the report.

After having done so much work upon it I feel that, by some sort of equity, I ought to be allowed to finish it. For that reason I venture to suggest that the U. S. Geological Survey allot what you consider a reasonable sum for the completion of the work under contract with me. Such an arrangement would make it possible to finish the field work during the coming summer and to submit the completed report about March or April, 1907.

About two thousand five hundred square miles of geology should be gone over, and all openings made since 1889 should be examined, statistics gathered, and maps corrected to date.

As to the cost I suggest that the assistants whose judgment you rely upon in such matters be asked to make a just estimate of the probable cost of the work if done by some equally competent person with details warranting the publication of the maps on a scale of an inch to the mile, and that the amount so agreed upon be the price for which I should do the work. It should furthermore be understood that this price is to cover all expenses of field-work, supervision, preparation of the manuscript report, drawings, maps sections, photographs, etc., up to the submission of the report to the editor, and that the survey is to be called upon only for the necessary copies of the topographic maps now in its possession and for such analyses and coking and fuel value tests as may be necessary for the work.

Yours respectfully,

J. C. BRANNER.

U. S. GEOLOGICAL SURVEY.
WASHINGTON, D. C., Feb. 16, 1906.

DR. JOHN C. BRANNER,
Stanford University, Cal.

Sir: The plan of cooperation for the survey of the Arkansas coal field, which you propose in your favor of February 9, in answer to my letter of January 31, seems to differ in no essential particular from those that have been considered in the past and that have not proved acceptable to this bureau.

We have here a large force of men who have had wide experience for the last 10 or 15 years in coal work in various parts of the country, and also in connection with the Coal-Testing Plant at St. Louis, and we would not care to consider any proposition which would take the survey of the Arkansas coal field out of the control of these men.

The demands for a resurvey are so great that we feel compelled to enter the field, and, while the work done by you a number of years ago would doubtless be of some assistance to us, practically we expect to resurvey the entire region as though no previous surveys had been made. As

stated before, the only form of cooperation that is at all practicable is that proposed in my letter of January 31. This seems to be reasonable and just, and will give you full credit for all of the work that you have done, and for the maps of the region which you have prepared. Should you not be willing to accept this proposition, your material will be of little value, and there will be no hope of future publication.

We propose to send a party into the field on or about March 1, and if you feel inclined to accept our proposition, we shall be glad to hear from you at your earliest convenience so that the party may have the benefit of your material.

Very respectfully,

CHAS. D. WALCOTT,
Director.

(Sub-signatures M. R. C. and C. W. H.)

STANFORD UNIVERSITY, CAL.,
February 26, 1906.

HON. C. D. WALCOTT,
Director of the U. S. Geological Survey,
Washington, D. C.

Sir: I beg to resign my position as geologist of the United States Geological Survey.

The immediate reason for my resignation is that I consider the action of the survey as communicated in your letter of the sixteenth in regard to my work upon the coal regions of Arkansas as an outrage and an unwarranted personal affront to which no self-respecting geologist can tamely submit.

Respectfully yours,

J. C. BRANNER.

WASHINGTON, D. C., March 8, 1906.

DR. J. C. BRANNER,
Stanford University, Cal.

Dear Sir: Your letter of February 26, containing your resignation from the survey, is received. I sincerely regret that you have felt impelled to take this action. Certainly no outrage or affront was intended in my letter and I fail to understand the reasons for your position.

The field work of the Arkansas Survey in the coal districts was done, as I understand, about eighteen years ago. It was based upon topographic maps which are much below the present standard and which could not be published on the present scale without thorough revision, amounting in most cases practically to a complete resurvey.

It is no reflection upon that work or the geologists who were responsible for it to say that it does not come up to present standards, and, therefore, could not be accepted for publication by this survey. Moreover, the active development since the state survey work was done now makes a large amount of information available which was quite inaccessible in 1888, and any publication by this survey would be judged by present standards and in view of this new information. We have refrained from entering this field notwithstanding many urgent requests, in consideration of the fact that your final report remained unpublished. It now seems necessary to meet the demands for information which have become especially insistent since the results of the fuel-testing work at St. Louis have indicated new and important uses for this coal. Also several serious complaints have been made of specific errors in the map of the Arkansas coal fields published in the Twenty-second Annual, by which considerable losses have been occasioned.

A resurvey of the region being therefore necessary, it seemed to me that the work should be done by members of the regular survey force, from whom immediate results could be obtained and whose salaries must in any case be provided for. I was anxious to obtain your unpublished data, for which adequate payment would have been made and full credit given, both as a matter of justice to yourself and to avoid the duplication of so much of the work as could be utilized. I still think this is by far the best way in which this unpublished material can be utilized, but shall not urge your acceptance of the offer.

I shall hold your resignation for the present with the hope that you may be willing to reconsider the matter.

Very respectfully,

CHAS. D. WALCOTT,
Director.

(Sub-signature C. W. H.)

STANFORD UNIVERSITY, CAL.,
October 13, 1906.

HON. CHAS. D. WALCOTT,
Director of the U. S. Geological Survey,
Washington, D. C.

Sir: Your reply of March 8, last, to my proffered resignation was duly received. I have postponed answering your letter in the hope that time might enable me to see the wisdom and justice of your decision, and to feel less acutely the personal reflection upon myself and upon my assistants implied by the survey's action. Seven months have now passed since I received your letter of February 16, telling me that you would not consider any proposition that would leave me to finish my own work, and reminding me that

unless I turned over the data collected by me and by my assistants my 'material will be of little value, and there will be no hope of future publication.' In the meanwhile I have made every reasonable effort to get your point of view, to put myself in your place, and to find some excuse for a course of action on the part of the U. S. Geological Survey that, on the face of it, seems so unjust, especially as it discredits me not only in the eyes of my colleagues but in the estimation of the people of the state of Arkansas whom I have faithfully tried to serve.

To my great regret not only am I unable to find any just reason for your action in this case, but the more I have informed myself regarding the attitude of the survey toward individual workers in geology throughout the country the more have I been convinced that I can not remain a member of that organization.

Justice to myself requires that I say a word regarding the reasons for your course put forward in your letter of March 8. These reasons appear to be:

1. The field-work on the Arkansas coal region was done eighteen years ago.

2. It was based upon poor maps.

3. The work is not 'up to present standards,' and therefore could not be accepted for publication by the survey.

4. New uses for the coals have been found by the fuel-testing plant of the survey.

5. Losses have been caused by errors in a map of the Arkansas coal fields for which I am responsible.

6. The salaries of the regular assistants of the survey being provided for work must be given them.

7. You say: 'I was anxious to obtain your unpublished data, for which adequate payment would have been made and full credit given.'

Inasmuch as these are put forward as the real reasons for the survey's action in this case I beg to call to your attention the following facts:

1. It is fully recognized that the work was done so long ago that it needed to be brought up to date. Many new mines have been opened and much information is now available that was not available when the original work was done. But having originated and directed the survey of the Arkansas coal fields I hold that *it was altogether reasonable that I should be allowed to bring the report up to date, and if it needed correcting that I should be permitted to correct it.*

2. As for poor maps let me remind you that when my work was begun in the Arkansas coal fields the maps of that region made by the U. S. Geological Survey were so poor that they were absolutely useless. The topography was shown with contour intervals of fifty feet, an interval so large that the characteristic features of the country were lost sight of, the land lines were not put on them at all, and the work had all the ear-marks of haste and indifference to the needs of the people. I was, therefore, obliged to remap the region on a scale of a mile to the inch with twenty-foot contour intervals. The maps made under my direction were based upon the land-office plats, and were necessarily cheap maps. But they were so much better than those made by the U. S. Geological Survey that the survey engraved them for me, and owns the original plates. If you have any doubt about the truth of these statements you only need compare the Fort Smith sheet of the U. S. Survey made in 1887 with the sheets of the same region made afterwards under my direction and engraved by the U. S. Survey. Under the circumstances reference to poor maps comes with bad grace from the director of the U. S. Geological Survey. The main weakness of the poor map excuse, however, is that nothing was said in our correspondence regarding topographic work. It was taken for granted that *if the topography needed revision it could be revised for me as well as for some one else.*

3. One would suppose that the statement that the work is not up to present standards was based upon some sort of knowledge of the report. As a matter of fact neither you nor any of your assistants have read the report, and you can not, therefore, know anything about its relation to standards of any kind. Moreover, even without reading it, *the U. S. Geological Survey offered to publish this same report in January, 1902,* on condition that I should consent to the publication of the maps on a scale so small as to make them useless to the people of Arkansas. One might suppose that it was up to standard in 1902 but had degenerated by 1906.

4. Referring to the new uses found for Arkansas coals by the fuel testing laboratory of the U. S. Geological Survey, let me remind you that *I had fuel tests made of the Arkansas coals in 1888, long before the U. S. Survey began the investigation of the fuel values of the coals of any part of this country.* The results of these tests are given in the preliminary report on Arkansas coals, pages 67 to 79, published at Little Rock in 1888, and it was expected that the final report would contain much additional data.

The reference to fuel testing, however, can hardly be taken as a real reason for your action, because I explicitly stated in my letter of February 9 that I should have to depend upon the U. S. Survey 'for such analyses and coking and fuel tests as may be necessary for the work.'

5. You seek to throw blame upon me for losses caused by errors in a map. The map referred to is given at page 390 of the twenty-second annual report of the U. S. Geological Survey, Part III. It is a sketch *map on a scale of twelve and a half miles to the inch.* If such losses ever were incurred, it is the first case I have ever heard of in which coal lands have been bought upon locations taken from a map of so small a scale.

6. The suggestion that the regular assistants of the survey must have something to do in order to earn their salaries might lead one to infer that the great bulk of the geology of the United States has been worked up and that nothing now remained but a few areas here and there like the coal fields of Arkansas. Knowing the opposite to be the truth I am unable to see that it was necessary to enter the territory of a colleague against his will for the purpose of finding work for the regular assistants of the survey.

7. In spite of the fact that my work was done eighteen years ago, and in spite of its not being up to 'present standards' you say that you were anxious to obtain it and that 'adequate payment would have been made.'

The reports of the Arkansas Geological Survey not being my personal property I leave others to characterize your proposition to pay me for one of them.

The above facts make it plain that the true explanation of your course in this matter is not frankly set forth in your three letters. The real reasons must be sought elsewhere, and I know of no place to look for them save in the general policy of the U. S. Geological Survey as reflected in its attitude toward the geologists of the country since the present director came into office.

The attitude of the survey toward the geologists of the country has come to be simply intolerable. No geologist has any rights that the survey feels bound to respect, unless indeed the geologist has political backing that makes it worth the survey's while to treat him with some sort of consideration.

If this treatment of myself and of my assistants were the first instance of the kind there might be some hope of the matter being set right; but such is not the case. Not only are our fields of operation unceremoniously invaded, but work is taken out of one man's hands to be put into another's without any reason other than the authority given by the power to do it, or through some desire to favor one person rather than another. If one asks for a reason he is grandiloquently referred to the general authorization to 'map the national domain.'

By this process not only are the rights of individuals encroached upon, but local interests are overridden, state organizations are first discredited and then driven out of existence, and even the privacy of our educational institutions is invaded and discredited in the eyes of the very people for whom and by whom they have been founded. In Arkansas the national survey gradually invaded the field of the state survey until now it would be impossible to induce the state to carry on a geological survey of its own. If members of the legislature were now asked to provide for a state survey they would simply say that such work was entirely unnecessary because if it were wanted the national survey would do it and work already done would be cited in support of the statement. By this process have the state surveys, formerly the pride of the states, been either completely wiped out or so enfeebled that they only survive with the consent and approval of the national organization. Sometimes this approval is under the form of 'cooperation' by which the state appropriates money for the use of the national survey. In some instances the director of the U. S. Survey has even gone to the extent of writing to members of state legislatures and advising against the support of state surveys unless it were done in a way to suit the national organization.

A single case of the discrediting of local geologists by the policy of the present director of the survey is sufficient to show where every teacher of geology in this country stands if the survey sees fit to use its power to discredit him.

A few years ago the national survey sent an assistant to work up the geology of the Fayetteville folio in the state of Arkansas. Fayetteville being the seat of the State University, the professor of geology in that institution, in order to save his face, was compelled to ask as a favor that he be allowed to help, in a subordinate position, to do the work on his own campus and in his own door yard. And even though this concession was finally made, he stood discredited as a geologist before the people of the state, before the trustees of the university, before his colleagues in the faculty, and before his own students. For what were they to think of him as

a geologist if some one had to be sent in from elsewhere to do the work under his very nose?

And if the professor should protest, what answer would he get? That the assistants sent to do the work are competent men; that the national survey is authorized to enter every part of the national domain; that the state institutions have not the money to do the work with; that the assistants of the survey must do something to earn their salaries. And these things are all true enough, though the total results are none the less unfortunate and none the less fatal to an interest in geology among the people. For if the national survey can thus, under cover of national authority, injure the professional reputation of the professor of geology in one university, it can do it for any professor in any college or university in this country, and we have no redress.

Against all this sort of thing I not only enter my most vigorous protest, but I can not allow my name to stand on the roll of an organization so thoroughly undemocratic, and so thoroughly out of sympathy with the local interests of the country. In my opinion a public bureau administered in the spirit that has grown up in this one ought to have no place in a republic where it is important that there should be a widespread interest in science, and above all a feeling of safety for every worker, however humble.

Finally I beg to remind you that the question here at issue is not a question of geology, but a question of the administration of a public bureau.

I remain

Yours respectfully,

J. C. BRANNER.

THE PRESIDENCY OF THE MASSACHUSETTS INSTITUTE OF TECHNOLOGY.

ANNOUNCEMENT has been made that the executive committee of the corporation of the Massachusetts Institute of Technology has selected Dr. Andrew Fleming West, professor in Latin in Princeton University, for the vacant presidency. It is ungracious to question an appointment of this character, and nothing could be gained by criticism if it were not that the corporation has not yet acted and Professor West has not yet accepted.

Professor West possesses many of the qualities that should be found in a college president. He was not elected to succeed President Patton at Princeton, but he would have been an excellent president for an institution, which more than any other of our universities or semi-universities has been imbued with his ideals. These may be illustrated by a quotation from Professor West's most recent address. He writes: "And so I return to the opening thought: The old college ideal is the true one." The opening thought was "The living root of the old faculty, as of every other part of the college, was a distinctively Christian impulse * * * the old college faculty at least professed and tried to show that God is the end of all our knowing and that Christ is the Master of the Schools."

But it is a long way from the chair of Latin in a classical and monastic college to the presidency of the Massachusetts Institute of Technology. It is to be feared that the trustees who favor the election of Professor West have been influenced by two factors. He is said to be known at Princeton as 'three-million-dollar West,' in view of his part in securing endowment for the institution, and he is known in the educational world as an opponent of President Eliot and the Harvard system. The writer once heard Professor West read a paper in which he said that the connection of the elective system and the three-year course at Harvard University was perhaps not accidental, as three years were enough of that sort of thing. But it is dangerous to cross swords with President Eliot, who replied that he had also noticed the connection between the elective system and the three-year course, but that he interpreted it as meaning that under the elective system a student could accomplish as much in three years as he could in four under the fixed curriculum.

It would seem to an outsider that in the present emergency the Massachusetts Institute of Technology needs for its president one of its own men, imbued with its methods and traditions, a man bred to science, believing in science as the chief factor in culture and in life, knowing that pure and applied science must go forward hand in hand, a man who would ally the institution with the city and the state rather than try to coax money from millionaires.

The corporation of the institute has recently met a disastrous defeat in its attempt to form a merger with Harvard University against the wishes of the faculty and alumni. Should it be so ill-advised as to elect a president without consultation with the faculty, it is to be hoped that Professor West will not accept until he assures himself of their approval. It is indeed quite possible that the election will be welcomed by the faculty, and that they will obtain a president beyond reproach—in which case science will have captured a captain from the enemy's camp.

J. McKeen Cattell.

SPECIAL ARTICLES.

A SIMPLE METHOD OF ILLUSTRATING UNIFORM ACCELERATION.

The following method of illustrating in the presence of a class (or as a simple laboratory exercise) the principle of uniformly accelerated motion exceeds in simplicity, accuracy and interest any that I have hitherto found.

A ball rolling down a groove in an inclined plank and at the same time vibrating across the groove has a constant acceleration in one direction, while its transverse vibrations are pendular motions that mark the time. If the groove be painted black and well polished, lycopodium dusted on the groove will preserve a very sharp trace of the motion of the ball. When the powder has been blown off by a wave of a fan the trace comes out with the distinctness of a sharp chalk line. The distances traversed in successive vibrations of the ball are measured along a white thread stretched accurately in the middle of the groove (or along a white paint line). The two motions should start simultaneously in the middle of the groove; this may be secured by allowing the ball to roll initially along a transverse brass strip extending to the middle of the groove.

The frictional resistance to the motion of the ball is negligible and the constancy of the ratio of linear distance to square of number of vibrations depends only on the accuracy of the measurements and the straightness of the plank.

To illustrate the principle of constant acceleration the actual period of vibration of the ball is not required; but it may be found by observation or by timing a short pendulum that vibrates in unison with the ball. The linear acceleration of the ball can readily be shown to be $5/7\ g$ sin (inclination of plank). The vibrating ball is a simple pendulum of length equal to the distance from the center of the ball to the center of curvature of the groove; but, to calculate the period, $5/7\ g$ must be used instead of g.

Several other points of interest may be noted. The record may be obtained by dusting the powder on the groove *after* the ball has rolled down. The record can only be completely removed by a damp cloth. The track of the ball on the powder is very curious and interesting, consisting of a ridge of powder with a clearing on each side. A very striking lecture experiment is to use fine sulphur powder instead of lycopodium; if the plank be raised to a vertical position, and brought down sharply on the table the record will appear instantaneously. If the plank be horizontal, the path of the ball will be a nearly perfect simple harmonic wave. If the grooved plank be placed on an inclined-plane plank, the coefficient of kinetic friction between the two may be deduced from two records, the first with the grooved plank held at rest, the second with the grooved plank in sliding motion.

I have found a groove five feet long, four inches wide and of four inches radius and a steel ball one and a half inches in diameter very satisfactory. The groove could be chipped out in a moment on a molding machine with knives of sufficient size; but, in the absence of such facilities, a number of longitudinal saw cuts of graduated depth, made by a circular saw, will render it easy to chisel the groove out by hand.

The International Instrument Co., of Cambridge, Mass., will supply the above apparatus on order.

A. Wilmer Duff.
Worcester Polytechnic Institute,
Worcester, Mass.

CURRENT NOTES ON METEOROLOGY.

METEOROLOGY OF THE NILE BASIN.

A VALUABLE report on 'The Physiography of the River Nile and its Basin' (1906, 4to, pp. 411), by Captain H. G. Lyons, Director-General of the Survey Department of Egypt, shows how rapidly our knowledge of the physiographical and meteorological conditions of northern Africa is being enlarged. This volume, of over four hundred pages, illustrated by means of nearly fifty charts, diagrams and maps of various kinds, is very effective evidence of the energy and ability of the present chief of the Egyptian Survey Department. A second smaller publication, 'The Rains of the Nile Basin in 1905' (Cairo, 1906, pp. 40, pls. IX.), deals with the rainfall of one year. It includes monthly rainfall maps, and some interesting diagrams of Lake Victoria levels; of gauge readings for Lake Albert, Bahr el Ghazal, White Nile, Blue Nile, Atbara and Nile, and also an instructive comparative diagram of Nile floods. Much popular interest has always been excited by the famous Nile overflows. With each succeeding year the factors concerned in these overflows are more carefully worked out and more thoroughly understood.

COLD WAVES IN THE UNITED STATES.

BULLETIN P of the Weather Bureau, by Professor E. B. Garriott, deals with 'Cold Waves and Frost in the United States' (1906, 4to, pp. 22, charts 328), and is a very useful collection of charts which teachers will be able to put into the hands of classes in meteorology. In the text there is a chronological account of historical cold periods in the United States, and a summary and classification of the more important cold waves and frosts in the period 1888–1902, inclusive. A considerable body of material is here collected, in very convenient form for study, and it is to be hoped that some competent person who has the necessary time at his disposal will give these charts the attention which they merit, and will deduce from them various important conclusions which have not yet been reached concerning both cold waves and frosts.

CLIMATE OF ALASKA.

A REPORT on 'The Climate of Alaska,' by Cleveland Abbe, Jr., forming part of a recent publication on the geology and physiography of that territory, appears separately as an extract from *Professional Paper No. 45*, U. S. Geological Survey, pp. 133–200. The available records have been carefully studied and summarized, and although the conditions of observation were in many cases not all that could be desired, so far as accuracy, exposure of instruments and regularity are concerned, yet this volume presents a valuable body of information which was much needed in many quarters. The discussion in the text is clear and concise. The tabulations are well arranged and in several cases unusually complete. And there is a satisfactory recognition of the human relations which is all too rarely found in climatic reports.

COLORADO COLLEGE OBSERVATORY.

THE semi-annual *Bulletin* of the Colorado College Observatory (June, 1906) contains the meteorological statistics, with an introductory explanation, by Professor F. H. Loud, the director; 'Colorado Springs Weather Records,' by Chester M. Angell, being a table of meteorological statistics for 1872–1903, and a second paper on the 'Evolution of the Snow Crystal,' by J. C. Shedd.

NOTES.

AT a meeting of the Scottish Meteorological Society held on July 12, 1906, a paper by Dr. Alexander Paterson, of Hebron, Syria, was read, in which, on the basis of ten years' recent observations at that station, it was held that the climate is now much the same as the scriptures show it to have been 3,000 years ago.

THE Fourteenth Report of the *Sonnblick-Verein* (1905) contains an account of the observatory Reina Margherita on Monte Rosa, with a view of the royal party, including Queen Margherita, on its ascent of the Gnifettispitze.

THOSE who wish to keep up with the progress that is being made in kite meteorology will need to consult 'The Vertical Temperature Gradients on the West Coast of Scotland and

at Oxshott, Surrey,' by W. H. Dines (*Proc. Roy. Soc.*, Vol. 77, 1906, 440–458). This work was done under a grant from the British government and from the British Association.

R. DeC. Ward.

RESEARCH LABORATORY OF PHYSICAL CHEMISTRY OF THE MASSACHUSETTS INSTITUTE OF TECHNOLOGY.

The Research Laboratory of Physical Chemistry has opened with a staff consisting of seven research associates and four research assistants. The new members of the staff are Herbert T. Kalmus, M. I. T. '04, Ph.D. (Zurich), Ledyard W. Sargent, A.M. (Harvard), E. B. Spear, A.B., Manitoba, and Fred C. Mabee, A.M. (McMaster University). In addition, researches are being pursued in the laboratory by five candidates for the degree of Doctor of Philosophy and one candidate for that of Master of Science. All the members of last year's staff remain.

To one of the research workers, Mr. Richard C. Tolman, a grant of three hundred dollars has been made during the summer from the C. M. Warren Fund of the American Academy of Arts and Sciences, to enable him to construct what will probably be the most powerful centrifugal machine ever made for experimental purposes, to be used in connection with an investigation of the electromotive force produced at the two ends of a rapidly rotating solution of any ionized substance. A grant of three hundred dollars from the Rumford Fund of the American Academy has also been made to Professor A. A. Noyes, which is to be used for the construction of a calorimeter adapted to direct thermochemical measurement with solutions up to 100°.

A gift has just been made to the laboratory of a large diamond valued at three hundred and fifty dollars by the Ansonia Brass and Copper Company. This is to be used in insulating the electrode within the bomb used in the conductivity investigations at high temperatures, and will entirely eliminate the error due to contamination which has been involved in the previous work where it was necessary to use quartz insulators.

A series of twelve articles on the electrical conductivity of aqueous solutions, describing the investigations on this subject made during the last three years in the laboratory, is in process of publication by the Carnegie Institution at Washington. A large part of a revised scheme of qualitative analysis for the common elements, which has been worked out during the past year by A. A. Noyes and W. C. Bray, has just appeared in the September number of the *Technology Quarterly*.

THE PERKIN LIBRARY.

Professor Chandler, who presided at the Perkin Jubilee banquet in New York, made the following statement with regard to the proposed Perkin library:

In order to honor the name of our distinguished guest for all time, it is proposed by the committee of 150 chemists and other prominent citizens who have organized this jubilee celebration, to establish in New York City a complete chemical library in duplicate; one set of books to constitute a permanent reference library always available for any one who wishes to consult it at the home of the Chemists Club, and one set equally complete for circulation throughout the country among the members of the chemical profession.

It can be truly stated that there is not a complete chemical library in the United States. Several of our larger universities have fair libraries, but each one of them lacks something that the searcher is sure to want. Moreover, these libraries are not accessible to many of the chemists. There are now about 8,000 professional chemists in the United States—teachers in our universities, colleges and high schools; professional consulting chemists and chemists in manufacturing establishments, water works, experiment stations, etc. Very few of them have access to even a respectable chemical library.

It is proposed that the circulating library shall be cared for by two or more thoroughly educated chemists to whom any chemist in the United States may apply for information on any chemical subject. The chemists in charge will keep reference lists of the best books and

journal articles on every chemical subject and supply this information when called for, and if desired, send the books containing the references by express.

It is even proposed to make arrangements to have articles copied if necessary, and even to have translations made. In other words, it is hoped that with proper endowment and proper support the Perkin Library will become of the utmost value to the chemical profession. All that is necessary is the interest and cooperation of the chemical profession and some assistance from others.

SCIENTIFIC NOTES AND NEWS.

ON the occasion of the dedication of the new engineering building of the University of Pennsylvania on October 19, honorary degrees of doctor of science were conferred as follows: Alexander MacKenzie, colonel of the United States Engineers; Samuel Sheldon, professor of physics and electrical engineering in the Brooklyn Polytechnic Institute; Mansfield Merriman, professor of civil engineering in Lehigh University; Frederick P. Stearns, chief engineer of the Boston Metropolitan Water Board; Edgar Marburg, professor of civil engineering in the University of Pennsylvania; Charles Whiteside Rae, engineer in chief of the United States Navy; Henry Wilson Spangler, professor of mechanical and electrical engineering in the University of Pennsylvania; M. M. H. Vetillart, representative of the government of France at the dedication; Frederick Winslow Taylor, consulting mechanical engineer, of Philadelphia; Samuel Matthews Vauclain; John Fritz, mechanical engineer, Bethlehem, Pa., and Ramon Icarrola, representative of the Mexican government.

SIR DAVID GILL, astronomer royal in South Africa, is about to retire from the active duties of the position.

THE third course of lectures on the Herter foundation at the Johns Hopkins University was delivered by Sir Almroth E. Wright, M.D., F.R.S., late professor of pathology in the Army Medical School, Netley, and pathologist to the St. Mary's Hospital, London. The subject of the lectures was 'The therapeutic inoculation of bacterial vaccines and its application in connection with bacterial disease.'

DR. W. OSLER delivered the Harveian oration at the College of Physicians, London, on the eighteenth inst.

THE seventh annual Huxley memorial lecture of the Anthropological Institute will be given on November 1, when Professor W. M. Flinders Petrie, F.R.S., will deliver an address on 'Migrations.'

THE National Health Society will hold a public meeting at University College, London, on October 29, to discuss the subject of the purity of the meat and milk supply. The chair will be taken by Sir Frederick Treves, and among the speakers announced are Sir William Broadbent and Sir James Crichton-Browne.

THE Bradshaw lecture before the Royal College of Surgeons of England will be delivered by Mr. Edmund Owen, December 12, the subject being 'Cancer: its treatment by modern methods.'

MR. F. W. LEVANDER has been nominated for president of the British Astronomical Association. The election will take place at the annual meeting on October 31.

DR. ROBERT E. COKER has resigned the Adam T. Bruce fellowship in biology in Johns Hopkins University, having been appointed by the Peruvian government to take charge of the work in connection with the marine fisheries in Peru.

MR. LOUIS J. DE MILHAU, A.B. (Harvard, '06), and Mr. John W. Hastings, A.B. (Harvard, '05), A.M. (Harvard, '06), have been appointed members of the Peabody Museum staff as ethnologists of the South American Expedition.

DR. G. C. SIMPSON, lecturer in meteorology at the University of Manchester, has been appointed assistant to the director of observatories under the Indian government.

J. B. MOWRY has been appointed commissioner of forestry in Rhode Island.

MR. J. J. DEARBORN, of the Harvard Forestry School, has been appointed assistant to

Professor F. W. Rane, state forester of Massachusetts.

Dr. G. H. Whipple has been appointed assistant pathologist at the Johns Hopkins Hospital, to succeed Dr. C. H. Bunting, who has resigned to accept the position of professor of pathology at the University of Virginia.

Dr. Henry M. Hurd, professor of psychiatry in the Johns Hopkins Medical School, has been given a year's leave of absence and will spend it in Europe, leaving about November 15.

A Reuter message from Wellington, New Zealand, reports that a monument to Captain Cook was unveiled on October 8 in the presence of a large gathering of both races at Poverty Bay, on the east coast of the North Island, at the spot where the explorer landed.

The German Dermatological Society has decided to subscribe 5,000 Marks to the Fritz Schaudinn fund, and to give the first volume of the society's publications the title 'In Memoriam Fritz Schaudinn.'

The Museo Goeldi at Para, in Brazil, desires an American naturalist, a young man of solid character, who can adapt himself to new surroundings, as taxidermist and general preparator in the museum. Application may be made to Dr. Goeldi, 399 Caixa Postal, in Para, or to Dr. John C. Branner, at Stanford University, Cal.

Sir George Darwin has invited the International Geodetic Congress to meet at Cambridge in 1909.

Since October 1, 1906, no publications are sold by the Nautical Almanac Office or by the Bureau of Equipment. All orders for copies of the *American Ephemeris, Nautical Almanac* or astronomical papers should now that date be addressed to the superintendent of documents, Government Printing Office, Washington, D. C.

We learn from the *Journal of the American Medical Association* that the mother of the late professor of chemistry at Basle, George W. A. Kahlbaum, has presented $9,500 to the National Society for the Study of the History of Medicine and Science, which was recently founded by her deceased son. She has also given the Berlin branch of the same society $5,000.

The Chemical Engineer states that the committee on the purity of reagents of the American Chemical Society, J. H. Long, chairman, has decided that it is inadvisable at this time to publish a book on the testing of reagents, as the amount of new data collected is so small that such a work would be only a duplicate of the well-known work of Dr. Krauch. It was also decided to limit the work of this committee, in the immediate future, to the commoner acids and alkalies, and to send out circulars to prominent manufacturers, in this country and Europe, inquiring as to the methods in use by them for testing for impurities found in the reagent grades of these acids and alkalies. Dr. H. N. Stokes, of the Bureau of Standards, has been chosen secretary of the committee. This bureau now has two chemists working upon methods of testing for reagents. So far their attention has been chiefly devoted to perfecting an accurate colorimetric method for determining traces of iron in reagents.

Two years ago, after two years' continuous effort, the New York Zoological Park secured a fine specimen of the almost extinct California condor. The bird has been kept in fine health until a few days ago. Last Saturday, however, it showed signs of illness, and on Tuesday it died, evidently in great pain. Previous to the autopsy its death was a mystery; but Dr. Blair's examination soon revealed the cause. This fine bird, worth at least $300, and the only specimen obtained in four years, was killed by a large rubber band, presumably administered by some visitor. The rubber band had lodged in the pyloric orifice of the stomach, completely closing it, and arresting the entire process of digestion. It is such exasperating occurrences as this and the murder of a valuable bear with four peach-stones that compel the Zoological Society to forbid the feeding of animals by visitors. Hereafter the vigilance of the keepers and police will be redoubled, and visitors must refrain from offering any object to any of the wild crea-

tures in the Zoological Park, whether mammal, bird or reptile.

The British Medical Journal states that during the weeks ended August 18, 25, and September 1 and 8 the number of deaths from plague in India amounted to 1,451, 2,113, 2,522 and 3,134, respectively. The principal figures are: Bombay Presidency, 879, 1,288, 1,388 and 1,850; Bengal, 70, 97, 115 and 83; United Provinces, 109, 164, 49 and 163; Central Provinces, 99, 109, 190 and 362; Madras Presidency, 8, 100, 9 and 10; Burmah, 182, 132, 112 and 92; Central India, 0, 197, 303 and 362. Baluchistan and the Frontier Provinces remain free from the plague. The worst area in the Bombay Presidency was Poona City, with 439 seizures and 399 deaths. Bubonic plague in monkeys and cats is reported from two districts in the United Provinces. In the jungles a number of wild animals are reported to have died of the disease.

WE learn from the *Experiment Station Record* that in order to make better provisions for research work in forestry, and to secure a permanent staff of forest experts for scientific research, as well as for training candidates for the government and state forestry service, the Imperial Forestry School at Dehra Dun, India, has been enlarged and hereafter will be known as the Imperial Forestry Research Institute and College. The college staff will include officers of the imperial service, holding the following positions: (1) Sylviculturist, who will make sylviculture his special study. (2) Superintendent of forest working plans, who will collect and collate statistics of the results of forestry management throughout India. (3) Forest zoologist, who will investigate the damages caused by insects and other pests. (4) Forest botanist, who will study the botany of forest plants, distribution of species, diseases of forest trees, etc. (5) Forest chemist, who will investigate the chemical properties of soils and forest produce. (6) Forest economist, who will study economic methods of commercial timber production and marketing. These officers, while engaged primarily in research work, will each deliver a course of lectures on his special subject in the college, and take part in the training of the students. The work of instruction, however, will for the most part be carried on by four assistant instructors.

IT is stated in *Nature* that the opening session of the International Congress on Methods of Testing was held in the Palais des Académies, Brussels, on September 3, under the presidency of Mr. F. Berger (Vienna). Five hundred members were present from eighteen different countries. Addresses of welcome were delivered by Count de Smet de Naeyer, the Belgian prime minister, and by Mr. H. Raemarckers, secretary of the Department of Railways. An address was then given by Professor F. Schüle (Zurich) in memory of the deceased president, Ludwig von Tetmejer. A report on the work of the executive council since the last congress was presented by Mr. Berger, and interesting papers on the iron and steel industry of Belgium and on the Belgian cement industry were read by Baron E. de Laveleye and Mr. E. Camerman. The mornings of September 4, 5 and 6 were devoted to the work of the sections and the afternoons to excursions. Excursions to the works of the Cockerill Company at Seraing and to Ostend were arranged for September 7, 8 and 9. The congress is held under the patronage of the King of the Belgians, who on September 2 received the members of council.

ACCORDING to the *Electrical World,* the Vienna Imperial Academy of Sciences has announced the result of its examination of uranium earth from the Joachimsthal state mines in Bohemia, conducted in the academy's laboratories in Vienna. About 50 tons of earth were subjected to tests and experiments, yielding radium products worth at the present market price more than $200,000. Dr. Hartinger conducted the investigation. The products thus obtained will not be sold, but will remain the property of the academy and will be used for further scientific research. The Austrian ministry of agriculture has decided to build its own laboratories at Joachimsthal for the production of radium salts. It is also proposed to exploit the healing properties of radium by establishing a health resort and using the springs in the mines for curative purposes, both in baths and for drinking.

UNIVERSITY AND EDUCATIONAL NEWS.

Mr. John A. Creighton, one of the founders of Creighton University, Omaha, Nebr., has deeded to that institution two buildings in the wholesale district, worth about $500,000.

Victoria University, of Manchester, has received £5,000 from the trustees appointed under the will of Miss Middleton, which will be used towards endowing the chair of anatomy.

The Boston *Transcript* states that at a meeting of the board of regents of the University of Kansas, a proposition was presented by Chancellor Strong to ask Mr. Andrew Carnegie for money with which to build a new fine arts building, but the proposition was voted down.

Mr. William A. Marburg, of Baltimore, has presented the Johns Hopkins Medical School with a valuable collection of medical books.

The new administration building of the Colorado School of Mines, which is to be known as Simon Guggenheim Hall in honor of the donor, was dedicated with appropriate ceremonies on October 17. The dedicatory address was delivered by the Rev. Dr. F. W. Gunsaulus, president of Armour Institute. Short addresses were also made by Rabbi W. S. Friedman, of Denver, and by Mr. George M. Post, in presenting to the school portraits of the donor and of the former president of the school, Dr. Regis Chauvenet, these portraits being the gift of the alumni. A large audience was present, including a delegation from the American Mining Congress, and representatives from the other educational institutions of the state.

Mr. Andrew Carnegie recently opened the new engineering and natural philosophy departments of the Edinburgh University, which were largely erected owing to his gifts. Mr. Balfour, chancellor of the university, in thanking Mr. Carnegie, Lord Elgin and other contributors to funds, conferred the degree of doctor of laws on Mr. Carnegie and Lord Elgin.

The senior officers in each department of study in the two undergraduate departments of Yale University and some others have had their annual salaries fixed for the coming college year at $4,000. The total number of professors affected by this change is about thirty-five. The salary list of the departments mentioned has been increased by about $9,000 by this rearrangement.

The chair of geology, at Vassar College, vacant by the death of Professor William B. Dwight, has been filled by the appointment of Dr. George B. Shattuck, associate professor at the Johns Hopkins University.

Dr. Arthur B. Lamb, instructor in electrochemistry at Harvard University, has been appointed assistant professor of chemistry and director of the Havemeyer Chemical Laboratory at New York University, in succession to Professor Morris Loeb.

John Charles Hubbard, Ph.D. (Clark), assistant professor of physics at New York University, has been appointed assistant professor of physics in the collegiate department of Clark University, Worcester, Mass.

The medical department of the University of Pennsylvania has established a department of experimental surgery, and Dr. J. E. Sweet, formerly connected with the laboratory of hygiene, and more recently with the Rockefeller Institute, has been placed in charge.

Dr. Alfred Schalek, of Chicago, has been appointed professor of dermatology and genito-urinary diseases in the medical college of the University of Nebraska, Omaha.

Dr. T. M. Taylor has resigned the position of instructor in chemistry at Oberlin College, which he has held for the past five years, to become a member of the faculty of the Carnegie technical schools at Pittsburg. His place will be taken by W. H. Chapin, 1904, who has resigned a fellowship in chemistry at the University of Pennsylvania to remain at Oberlin.

Dr. Zdenko Skraup, professor in the University of Graz, has been appointed professor of chemistry in the University of Vienna, in succession to Professor Adolf Lieben, who has retired.